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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/649,013	08/28/2000	Yasukazu Nihei	Q58716	7581

7590 11/27/2002
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EXAMINER

ANGEBRANNDT, MARTIN J

ART UNIT PAPER NUMBER

1756

DATE MAILED: 11/27/2002

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/649,013

Applicant(s)

NIHEI ET AL.

Examiner

Martin J Angebranndt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 13-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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1. The restriction requirement of 9/24/2002 is repeated here with the modification that group I includes only claims 1-12. The examiner acknowledges the applicant's election of group I, claims 1-13, without traverse in paper 5 and contacted Darryl Mexic on 11/21/02 to establish the election for the corrected restriction requirement. Accordingly, claims 13-18 are withdrawn from prosecution.

The examiner notes that incorporation by reference to NON-US patent documents such as those listed on pages 35-36 of the specification is improper and on this basis the specification is objected to

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

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such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 8 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Miyawaki et al. '750.

The coating of a lithium niobate crystal with a positive photoresist, which is contact exposed with a comb electrode pattern is disclosed. After development, Al is deposited on the patterned resist and acetone used in the lift-off process to remove the resist and overlying aluminum to form the comb electrodes. (7/32-60)

The examiner notes that contact exposure results in the near field exposure (14/19-15/3) as the pattern is in direct contact with the resist.

5. Claims 1 and 8 are rejected under 35 U.S.C. 102(e) as being fully anticipated by Byer et al. '221.

The coating of a lithium niobate crystal with a positive photoresist, which is contact exposed with a comb electrode pattern is disclosed. After development, Cr is deposited on the patterned resist. (12/25-48)

6. Claims 1,2,7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068.

Kanarian et al. '068 states that the lithium niobate may be used as the waveguiding medium with NLO response. (3/44-52). The coating of the Al electrode materials on the substrate, the overcoating of this with a photoresist and contact exposure of the resist with 405 nm light is disclosed. The resist pattern is then transferred to the aluminum by etching, followed by removal of the resist.

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It would have been obvious to one skilled in the art to modify the processes of either Miyawaki et al. '750 or Byer et al. '221 by using the metalization, resist processing and etching process taught by Kanarian et al. '068 for the same function with a reasonable expectation of achieving comparable results.

7. Claims 1,8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Hosaka et al. JP 08-179493.

Hosaka et al. JP 08-179493 (machine translation attached) discloses the use of contact masking processes where the light is coupled into the mask through a prism. See figures. The EBANNESSENTO (evanescent) light exposure uses the light more efficiently and results in increase fineness in the features which can be formed. [0006,0011 & 0017] The use of light of 460 nm is below is disclosed [0019].

It would have been obvious to one skilled in the art to modify the process of either Miyawaki et al. '750 or Byer et al. '221 by using the masking process of Hosaka et al. JP 08-179493 to more efficiently use the light and increase the resolution.

8. Claims 1,2 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068 and Hosaka et al. JP 08-179493.

It would have been obvious to one skilled in the art to modify the process of either Miyawaki et al. '750 or Byer et al. '221 combined with Kanarian et al. '068 by using the masking process of Hosaka et al. JP 08-179493 to more efficiently use the light and increase the resolution.

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9. Claims 1,8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of DeFornel et al. '464.

DeFornel et al. '464 teaches the use of a light on a fiber optic probe which allows for scanning exposure of the resist without contacting the resist. The resolution is below 100 nm when 400 nm light is used. (4/9-42) The use of 300 nm light is also disclosed. (8/60-63)

It would have been obvious to one skilled in the art to modify the process of either Miyawaki et al. '750 or Byer et al. '221 by using the exposure process of DeFornel et al. '464 to gain the benefits of increased resolution and reduced contact with the resist.

10. Claims 1,2,7,8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068 and DeFornel et al. '464.

It would have been obvious to one skilled in the art to modify the process of either Miyawaki et al. '750 or Byer et al. '221 combined with Kanarian et al. '068 by using the exposure process of DeFornel et al. '464 to gain the benefits of increased resolution and reduced contact with the resist.

11. Claims 1,3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576.

Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983), describe multilayer resist systems and their benefits. These include high resolution, higher aspect ratio, which translate to improved image transfer during etching, fewer depth of focus, topographical

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and interference effects. (290-294). The use of these systems in lift-off processing is disclosed (301-305). The use of RIE processing of bilayer resist is disclosed (309-310).

Saigo et al. '576 teach the use of resist bilayers where the topmost resist contains silicon. The topmost silicon containing resist is sensitive to UV and resistant to etch processes and the use of a two layer process increases resolution. (1/8-25 and 2/60-3/4). As only two layers are used, the process is simplified over three layer systems. (5/33-39).

It would have been obvious to one skilled in the art to one skilled in the art to modify the invention of either Miyawaki et al. '750 or Byer et al. '221 by using bilayer resist processes such as those taught by Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576 with a reasonable expectation of gaining the advantages in resolution, pattern transfer accuracy and reduced problems with interference effects and topography.

12. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576.

It would have been obvious to one skilled in the art to one skilled in the art to modify the invention of either Miyawaki et al. '750 or Byer et al. '221 combined with Kanarian et al. '068 by using bilayer resist processes such as those taught by Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576 with a reasonable expectation of gaining the advantages in resolution, pattern transfer accuracy and reduced problems with interference effects and topography.

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13. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068, Hosaka et al. JP 08-179493, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576.

It would have been obvious to one skilled in the art to one skilled in the art to modify the invention of either Miyawaki et al. '750 or Byer et al. '221 combined with Kanarian et al. '068 and Hosaka et al. JP 08-179493 by using bilayer resist processes such as those taught by Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576 with a reasonable expectation of gaining the advantages in resolution, pattern transfer accuracy and reduced problems with interference effects and topography.

14. Claims 1-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068, DeFornel et al. '464, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576.

It would have been obvious to one skilled in the art to one skilled in the art to modify the invention of either Miyawaki et al. '750 or Byer et al. '221 combined with Kanarian et al. '068 and DeFornel et al. '464 by using bilayer resist processes such as those taught by Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576 with a reasonable expectation of gaining the advantages in resolution, pattern transfer accuracy and reduced problems with interference effects and topography.

15. Claims 1-8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068, Thompson, L.F., et al.,

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"Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576, further in view of Harada et al. '308.

Harada et al. '308 teaches magnesium oxide doped lithium niobate with electrodes formed photolithographically to have a period of 4 microns. (example 1). The use of MgO-LN is recognized in the art as preferred, particularly due to higher damage threshold. (1/4-52)

It would have been obvious to one skilled in the art to modify the process of either Miyawaki et al. '750 or Byer et al. '221 alone or combined with Kanarian et al. '068, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576 by using the MgO doped lithium niobate as taught by Harada et al. '308 with a reasonable expectation of gaining the benefit of increased damage threshold in the resultant article.

16. Claims 1-8 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Miyawaki et al. '750 or Byer et al. '221, in view of Kanarian et al. '068, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983) and Saigo et al. '576, further in view of Harada et al. '308, Taguchi et al. JP 04-335620 and Yamanouchi et al. '197.

Taguchi et al. JP 04-335620 teaches periods of 1-30 microns and electrode widths of 0.5-15 microns. Periods of 10 and 2 microns are disclosed with lithium niobate materials. The electrode line width is the spacing between the electrodes as disclosed with respect to figure 1D as element 12a of the instant specification.

Yamanouchi et al. '197 teaches in embodiment 3, the formation of electrodes with a pitch of 0.6 microns on a lithium niobate substrate using conventional lithographic processing.

In addition to the basis provided above, the examiner holds that it would have been obvious to modify the invention of either Miyawaki et al. '750 or Byer et al. '221, combined with

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Kanarian et al. '068, Thompson, L.F., et al., "Introduction to Microlithography", pp. 288-335 (1983), Saigo et al. '576 and Harada et al. '308 by using electrodes with spacings of less than 0.3 microns as taught by Taguchi et al. JP 04-335620 and Yamanouchi et al. '197 to render it useful with shorter wavelengths.

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Singletary '470 discloses the use of fiber optics to expose resist materials.

Ogura et al. '059 teach contact exposures of diffraction grating patterns with respect to figure 3a (3/63-4/45). These are periodic patterns.

Bennett '438 teaches contact exposure processes for forming comb electrodes. (7/60-817)

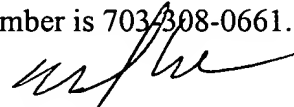
Elliott, D.J., "Integrated Circuit Fabrication Technology", (1982), pp. 188-191 teaches that the as of the 1980's, contact printing was the workhorse of the IC industry for over 20 years. The major problems were with resist sticking to the mask, which is solved by soft contact printing.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebrannndt whose telephone number is 703-308-4397. The examiner can normally be reached on Available Mondays-Thursdays and alternative Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

A handwritten signature in black ink, appearing to read 'm. angebrannndt', written over the printed name.

Martin J Angebrannndt
Primary Examiner
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November 21, 2002